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May 10, 2010

Terry O'Clair, Director
Division of Air Quality
North Dakota Department of Health
918 East Divide Avenue, 2nd Floor
Bismarck, ND 58501-1947

RE: Comments on the April 2010 Preliminary Best Available Control Technology Determination for Control of Nitrogen Oxides for M.R. Young Station Units 1 and 2

Dear Mr. O'Clair:

On behalf of the National Parks Conservation Association, Dakota Resource Council, Friends of the Boundary Waters Canoe Area Wilderness, Minnesota Center for Environmental Advocacy, Plains Justice, Sierra Club, and Voyageurs National Park Association, we respectfully submit the following comments on the April 2010 Preliminary Best Available Control Technology (BACT) Determination for Control of Nitrogen Oxides (NOx) for Minnkota Power Cooperative's Milton R. Young Station (MR Young) Units 1 and 2. We additionally attach and incorporate by reference comments on the June 2008 Preliminary BACT Determination and the draft Regional Haze Rule.[1]

The North Dakota Department of Health (NDDH)'s BACT determination incorrectly dismisses Selective Catalytic Reduction (SCR), the most cost effective, technically feasible control technology capable of reducing NOx emissions by 90% or better. By overestimating costs and misrepresenting technical capability, NDDH incorrectly dismisses SCR as BACT. Therefore, NDDH is proposing legally deficient NOx BACT emission limits for the two units at MR Young. In light of the flawed BACT determination and impacts of MR Young's NOx emissions on air quality, visibility, public lands and public health, we urge NDDH to appropriately revise its BACT analysis and accordingly require SCR as BACT for both MR Young units.

MR Young, located near Center, North Dakota, consists of two cyclone boilers firing lignite from the adjacent Center Mine. Unit 1 is owned by Minnkota Power Cooperative (Minnkota) and

[1] Comments of Plains Justice and Sierra Club on the June 2008 Preliminary BACT Determination for Control of Nitrogen Oxides at the Milton R. Young Station, July 30, 2008 [hereinafter " Plains Justice Comments]; Comments of National Parks Conservation Association et. al. on North Dakota's Regional Haze State Implementation Plan, January 8, 2010.

is 257 MW. Unit 2 is owned by Square Butte Electric Cooperative (Square Butte) and has a rating of 744 MW. Minnkota operates both units.[2]

In April 2006, the United States and the State of North Dakota filed a complaint for injunctive relief and civil penalties pursuant to sections 113(b)(2) and 167 of the Clean Air Act (CAA). 42 U.S.C. §§ 7413(b)(2) and 7477. The Complaint alleged Minnkota and Square Butte violated the Prevention of Significant Deterioration (PSD) provisions of CAA, as well as North Dakota's State Implementation Plan by undertaking construction of a major emitting facility without undergoing PSD review. Because of the complaint, the U.S. District Court of North Dakota ordered a Consent Decree for Civil Action No. 1:06-CV-034. The Consent Decree required Minnkota to install and operate control technology for the emission of NO_x.[3] The Decree sets out a two-step process for limiting NO_x emissions.

Phase 1 requires both units to "install and commence continuous operation of Over-fire Air" or a technology equivalent that will achieve a NO_x rate of no more than 0.36 lb/MMBtu based on a 30-day rolling average. Minnkota had until December 31, 2009 to install Over-fire Air at both units. Phase 2 requires Minnkota and Square Butte to perform BACT analyses for their respective boilers. The analyses must follow the BACT Top-Down approach that is laid out in the "New Source Review Workshop Manual—Prevention of Significant Deterioration and Nonattainment Area Permitting" (Draft October 1990) (NSR Manual), and must include any additional information requested by the Environmental Protection Agency (EPA) and NDDH. Additionally, the BACT analyses must "include an evaluation of Selective Catalytic Reduction, Selective Non-Catalytic Reduction, Over-fire Air, and Rich Reagent Injection, as well as other NO_x control technologies." Under Phase 2, NDDH must review the BACT analyses and make a BACT determination, which must include specific control technologies to be installed and a specific 30-day rolling average NO_x emission limitation for each unit.[4]

In accordance with the Consent Decree, Minnkota and Square Butte submitted BACT analyses and NDDH made its draft BACT Determination. In June 2008, NDDH preliminarily determined the BACT limit for Unit 1 is 0.36 lb/MMBtu, except during startup or shutdown, when the limit shall not exceed 2070.2 lb/hr on a 24-hour rolling average basis. For Unit 2, the proposed limit is 0.35 lb/MMBtu, with startup/shutdown period not to exceed 3995.6 lb/hr on a 24-hour basis. The proposed control technology for both units is Selective Noncatalytic Reduction (SNCR) operated in conjunction with Advanced Separated Over-fire Air (ASOFA). The April 2010 BACT Determination supplements and reaffirms the above conclusions of the June 2008 Preliminary BACT Determination.

[2] June 2008 Preliminary BACT Determination, p. 1.
[3] The Consent Decree also requires the installation and operation of control technology for the emission of sulfur dioxide and particulate matter.
[4] Consent Decree, at 19, 20.

NDDH subsequently reexamined the technical feasibility of three versions of SCR: high-dust SCR (HDSCR), low-dust SCR (LDSCR), and tail-end SCR (TESCR). Upon reconsideration, NDDH found LDSCR and TESCR to be technically feasible, and requested additional information and a revised BACT analysis from Minnkota.[5]

While we agree that LDSCR and TESCR are technically feasible, we disagree with the determination that HDSCR is technically infeasible for MR Young. As described in previous comments, HDSCR is technically feasible, and should be considered in the BACT analysis along with several other controls which were not evaluated or incorrectly evaluated.[6] To the extent that other issues with the BACT Determination remain the same, we reiterate and specifically incorporate the Plains Justice comments.

Further, in reviewing this BACT Determination, we note that the proposed BACT limits of 0.35 and 0.36 lb/MMBtu are over three times above the New Source Performance Standards of 0.11 lb/MMBtu, as revised in 2008. The revised NSPS do not appear to have been considered in this BACT Determination, and we would like a response as to why the state considers the higher proposed limits acceptable.

The NOx BACT analysis for MR Young must be considered in the context of the far-reaching impacts of the facility's NOx emissions on air quality, visibility, public lands and public health under step five of the top-down approach.

North Dakota's recently submitted regional haze state implementation plan (SIP) identified several Class I areas impacted by emissions from facilities in North Dakota, including MR Young. There are two Class I areas in North Dakota—Theodore Roosevelt National Park and Lostwood National Wildlife Refuge Wilderness Area – which are affected by NOx emissions from MR Young. Other Class I areas impacted by North Dakota sources of air pollution include: Badlands National Park and Wind Cave National Park in South Dakota, Medicine Lake National Wildlife Refuge Wilderness Area and U.L. Bend National Wildlife Refuge Wilderness Area in Montana, Boundary Waters Canoe Area Wilderness Area and Voyageurs National Park in Minnesota, and Isle Royale National Park and Seney National Wildlife Refuge Wilderness Area in Michigan.

These Class I areas preserve the region's inspiring landscapes, rare geologic formations, breathtaking water country, and diverse wildlife and vegetation. They also serve as living museums of our nation's history. Visitors from across the nation and globe are drawn to these lands and their tourist dollars benefit state and local economies.

[5] April 2010 BACT Determination, at 3.
[6] Comments of Plains Justice and Sierra Club on the June 2008 Preliminary BACT Determination for Control of Nitrogen Oxides at the Milton R. Young Station, July 30, 2008; Comments of National Parks Conservation Association et. al. on North Dakota's Regional Haze State Implementation Plan, January 8, 2010.

National parks and wilderness areas are of great natural and cultural value and also engines for sustainable local capital. For example, in 2008, National Park Service units received over 274 million visits accounting for over $2.5 billion in revenue.[7] National parks support $13.3 billion of local private-sector economic activity and 267,000 private-sector jobs.[8] They also attract businesses and individuals to the local area, resulting in economic growth in areas near parks that is an average of 1 percent per year greater than statewide rates over the past three decades.[9] National parks also generate more than four dollars in value to the public for every tax dollar invested.[10] Of the number of annual park visitors in 2008, approximately 516,804 people journeyed to Theodore Roosevelt National Park spending nearly half a million dollars. The same year 845,734 people visited Badlands National Park; 573,433 visited Wind Cave National Park; 221,585 visited Voyageurs National Park and 14,038 visited Isle Royale National Park.[11]

Excessive NOx emissions from MR Young and other North Dakota facilities not only obscure the region's scenic vistas, but also contribute to a host of public health problems as well as adverse impacts to wildlife and vegetation. For example, NO_x is a precursor to ground level ozone, or smog, which is associated with respiratory diseases, asthma attacks, and decreased lung function.[12] Beyond these direct health impacts, associated hospital admissions, decreased productivity, and lost school and work days have significant economic costs.

Maximizing reductions in NOx emissions from MR Young would not only help protect and restore treasured landscapes and the economies that rely on them, but also benefit public health. It is in this context that we offer the comments below for consideration by NDDH and encourage the Department to require SCR, the most efficient control technology, as BACT at MR Young.

With an estimated reduction efficiency of 93.8%, SCR is by far the top control technology for the MR Young facility and other like sources. The top control technology is assumed to be BACT unless significant adverse energy, environmental, or economic impacts will occur with its use. The analysis must provide a "comprehensive demonstration, based on objective factors, that the technology is inappropriate in the specific circumstance," if a technology is to be dismissed.[13] Such a comprehensive demonstration has not been provided.

Here, the BACT Determination cites two main reasons for erroneously concluding that LDSCR and TESCR are not BACT: (1) outstanding technical questions and (2) high cost effectiveness

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[7] *See* http://www.census.gov/compendia/statab/2010/tables/10s1215.pdf.
[8] Hardner and Gullison, "The U.S. National Park System, An Economic Asset at Risk" (November 2006) [prepared for the National Parks Conservation Association].
[9] Id.
[10] Id.
[11] *See* http://www.nature.nps.gov/stats/index.cfm.
[12] 70 Fed. Reg. 25162, 25169 (May 12, 2005).
[13] 1990 NSR manual, p. 120.

and incremental cost. These issues are overstated, and none preclude the application of SCR as BACT at MR Young. Collectively they do not justify a decision that SCR is not BACT. Rather, in light of all factors considered in a full BACT analysis, SCR is the appropriate choice as BACT for the MR Young facility.

1. **NDDH's Technical Feasibility Analysis is Legally and Technically Deficient**

NDDH maintains concerns about the technical implementation of LDSCR and TESCR, mainly as a result of the refusal of two catalyst vendors to provide catalyst life guarantees without pilot scale testing. These concerns are not a sufficient basis upon which to reject SCR as BACT.

SCR, including LDSCR and TESCR, is an available, established technology. It is in use at hundreds of coal-fired boilers, including cyclone furnaces, across the country and worldwide. It is used at facilities burning coals (including lignite), biomass, and wastes, as well as cement kilns and other sources with a variety of gas stream characteristics. While it has never been specifically applied to a facility using North Dakota lignite, no valid technical or other constraints make its installation technically infeasible. Rather, analysis reveals that its application is technically feasible and the most effective control option as detailed below.

Testing of the gas stream at MR Young has indicated high levels of sodium and potassium. In particular, one catalyst vendor, CERAM, stated that they were unaware of any SCR application with the level and form of sodium in the ash at MR Young. NDDH argues that this variation in the gas stream makes MR Young a "totally new and dissimilar source type" as described by the NSR Manual. This logic is erroneous. As noted by US EPA in comments on the June 2008 Preliminary BACT Determination, a difference in the gas stream characteristics does not by itself imply that that difference is significant enough to impact the successful operation of the control technology.[14] The variation in gas stream characteristics at MR Young is well within the wide variability already found in the universe of sources which have successfully adapted SCR to their site-specific parameters, making it similar to these facilities and therefore not preclusive of successful application of SCR technology.

The remainder of the section of the NSR manual cited by NDDH belies the intention to prevent unreasonable research burdens, not to prevent reasonable application of a well known technology to a similar but not identical situation:

> "A control technique is considered available, within the context presented above, if it has reached the licensing and commercial sales stage of development. A source would not be required to experience <u>extended time delays or resource penalties</u> to allow research to be conducted on a new technique. Neither is it expected that an applicant would be required to experience <u>extended trials to learn how to apply a technology to a totally new and</u>

[14] p. 6.

dissimilar source type. Consequently, technologies in the pilot-scale testing states of development would not be considered available for BACT review." [emphasis added]

In this instance, vendors have refused to offer guarantees of catalyst life without pilot testing at the MR Young facility. This does not mean, as posited by NDDH, that SCR is in the pilot-scale testing stage. Again, as addressed by US EPA in earlier comments, the question of pilot-scale testing pertains to the availability of a control technology, not its applicability, and SCR is plainly available.[15] The pilot-scale testing here would not require "extended time delays or resource penalties." Pilot-scale testing in this case is a means to optimize SCR design to a specific situation prior to more expensive full-scale installation.

The NSR manual elsewhere specifically addresses the lack of vendor guarantees, noting that "lack of a vendor guarantee by itself does not present sufficient justification that a control option or an emissions limit is technically infeasible."[16]

The principle of technology transfer, as outlined in the NSR manual, assumes some appropriate level of risk for transfer of a technology to a similar but not identical situation. With the extensive track record of successful adaptation of the various types of SCR to a wide variety of combustion sources and fuels, the risk inherent in applying SCR at MR Young is well within the bounds of that contemplated by the BACT process. To dismiss SCR on these grounds would, in fact, be contrary to the technology-forcing function of the BACT process that was intended by Congress.[17]

2. NDDH Fails to Accurately Calculate Cost Effectiveness of SCR

NDDH also argues that SCR is not BACT on the basis of cost, both total and incremental. This argument is flawed because the cost calculations are unclear, overestimated, and inappropriately compared only to regionally-limited BART determinations rather than generally accepted BACT cost effectiveness thresholds and prior BACT determinations.

The site specific cost estimates developed for MR Young generally lack sufficient detail to determine whether the claimed costs are supported. The cost calculations do not rely on the standard EPA Control Cost Manual, instead relying primarily on vendor quotes that are not available. Even the most detailed breakdowns of these costs provided in the BACT Determination and related material do not provide critical information about how the values were obtained.[18]

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[15] p. 10 – 14.
[16] B.20.
[17] See discussion in comments by US EPA on the June 2008 Preliminary BACT Determination, p. 14.
[18] See April 2010 BACT Determination Appendix B, Enclosure A, Attachment 1; Minnkota Responses to NDDH Request, NOx BACT Analysis Study, Milton R. Young Station Unit 1 and Unit 2, Regarding SCR Feasibility, December 11, 2009 as revised February 2011, Attachment 1; NOx Best Available Control Technology Analysis

While we disagree with the aspects of the cost analysis that are discernable, as discussed below, should NDDH opt to move forward based on these estimates, we request comprehensive and detailed material upon which the cost estimates rely be made available for public review, and an additional 30-day public comment period from the date the additional material is made accessible.

<u>Costs of SCR Are Overestimated</u>

Despite the lack of clarity and documentation of cost estimates, it is clear that some of the relied on costs are overestimated. The capital costs for a retrofit of SCR at MR Young, as reported on a $/kW basis, are significantly higher than those found by several studies of SCR installations. Those reports found a range of installed costs between $83 – 300/kW, the highest of which were highly complex retrofits with severe space constraints.[19] Of particular note is Wisconsin Electric's estimated cost to retrofit a cold-side SCR on Oak Creek Units 5-8. The estimated cost of $168/kW[20] was certified in July 2008 for construction by the Wisconsin Public Services Commission.[21] These are all significantly lower than the estimated cost of $543 – 706/kW for SCR installation at MR Young.[22] Even considering the slightly higher costs associated with the use of a cold-side SCR, the costs for MR Young are excessive and without basis. It is thus clear that costs have been overestimated, likely the result of numerous factors. Several of the issues contributing to excessive costs are documented below.

Annual Capital Costs

Total capital investment or TCI includes all costs required to purchase equipment needed for a control system, the costs of labor and materials for installing the equipment, costs for site preparation and buildings, and certain other indirect installation costs.[23] Cost effectiveness is determined by converting the total capital investment into an annual cash flow (annual capital costs), adding annual operating and maintenance costs, and dividing by the tons of pollution removed. This process results in an estimate of cost effectiveness expressed in dollars per ton.

Study – Supplemental Report, as revised February 2010, prepared by Burns & McDonnell Engineering Company, Inc. for Minnkota Power.

[19] See discussion on p. 16 – 18 of Comments on EPA's Advanced Notice of Proposed Rulemaking regarding Best Available Retrofit Technology (BART) for the Navajo Generating Station and the Four Corners Power Plant [EPA-R09-OAR-2009-0598] submitted by the Center for Biological Diversity et. al. October 28, 2009.

[20] Wisconsin Electric Power Company's Application to Install Wet Flue Gas Desulfurization and Selective Catalytic Reduction Facilities and Associated Equipment on Oak Creek Power Plant Units 5, 6, 7 & 8 for Control of Sulfur Dioxide and Nitrogen Oxide Emissions, Appendix C, Emission Reduction Study, Volume 1, Addendum August 20, 2007. Unit cost = ($190,500,000/1,135,000 kW) = $168 kW, in 2006$

[21] 70 Certificate and Order, Application to Install Wet Flue Gas Desulfurization and Selective Catalytic Reduction Facilities and Associated Equipment on Oak Creek Power Plant Units 5, 6, 7 & 8 for Control of Sulfur Dioxide and Nitrogen Oxide Emissions, Case 6630-CE-299, July 10, 2008.

[22] NOx Best Available Control Technology Analysis Study – Supplemental Report, as revised February 2010, p. 4-11, prepared by Burns & McDonnell Engineering Company, Inc. for Minnkota Power.

[23] Control Cost Manual, pp. 2-5 to 2-10.

The total capital investment is converted into annual costs by multiplying by a capital recovery factor or CRF. The CRF is given by:

$$CRF = [\, i(1+i)^n]/[(1+i)^n - 1\,]$$

where i is the interest rate and n is the life of the pollution control equipment. In essence, annualization establishes an annual payment sufficient to finance the capital investment for its entire life.[24]

The CRF depends on two factors, the interest rate and lifetime of the control system. The lower the lifetime, the higher the CRF and the higher the ratio of annual to total capital costs. NDDH underestimated the equipment lifetime, thus substantially overestimating the CRF and annual capital costs.

Equipment Lifetime

A lifetime of 20 years was assumed for the SCR. The default lifetime for SCR used in EPA's CUE Cost Manual is 30 years. A 30+ year service life is consistent with actual experience with existing SCRs and with the nature of the equipment.

An SCR system should last as long as the plant it is installed on. It is a stationary device whose major components have no moving parts and which uses few pieces of rotating equipment, e.g., pumps. It consists of ducting, a metal frame that is filled with blocks of catalyst, an ammonia delivery system (tank, pumps, piping), a control system, and instrumentation. The ducting and metal frame are similar to the balance of the plant and should last as long as the plant itself with proper maintenance. The ammonia injection system, accounting for a tiny fraction of the overall cost, should also last as long as the plant if wearable parts are replaced as part of routine maintenance. Thus, on a new facility, it would be expected to last 50+ years, or the life of the plant.

Vendor experience lists identify a number of SCR units that were installed more than 30 years ago in Japan that are still in service.[25] In the United Stated, Mitsubishi, for example, installed three SCR systems on process heaters at the Chevron Richmond Refinery in California in 1984. These units are still in service. There have been no maintenance, operational or compliance problems, and the original catalyst has not been changed out. These SCRs currently have a demonstrated life of 25 years with expectation for many more.

Further, the equipment life for an SCR based on a financial risk study conducted by Stephen Unwin, *et al.* for SCRs installed at the Monroe Power Plant outside of Detroit concluded a 30-

[24] Control Cost Manual, January 2002, Section 1, p. 2-21.
[25] McIlvaine Company, Worldwide Utility Plans, NOx Installation and Component Suppliers (Ex. 12); Vendor Experience Lists for Hitachi and Mitsubishi.

year life was reasonable. This study was designed to examine the economic risks from operating SCR at this plant, including siting characteristics and operating/maintenance strategy and their effect on SCR system lifetime. The authors' choice of a 30-year life for the SCR system is an important parameter in their study.[26]

On retrofits, such as these, SCR would be expected to last for the remaining useful life of the plant. Minnkota's cost analysis assumes only 20 years as the service life of the SCR. However, clearly, it could be much longer. The record does not disclose the remaining useful life of the MR Young units or the basis for selecting only 20 years when expected SCR life is plainly longer and SCRs in operation today have been in service for longer times.

The capital recovery factor for the BACT Determination's assumptions (i=6%, n = 20 yrs) is 0.08718. The capital recovery factor assuming 30 years, is 0.07265 or 83% that relied upon by the BACT Determination.

Maintenance Labor and Materials
The underlying materials for the BACT Determination estimated costs for maintenance labor and materials as 3% of installed capital costs.[27] The Control Cost Manual indicates these costs should be calculated as 1.5% of the total capital investment. Thus, these costs are overestimated by a factor of two.

Levelization Factor and Escalation
The annual operating and maintenance costs were increased by multiplying them by a "levelization factor" of 1.24873. Levelization escalates costs. The constant levelization factor is generally used to express the relationship between the value of an expenditure at the beginning of the first year and an equivalent annuity, or levelized value. It depends on both the annual cost of money or the discount rate and the nominal escalation rate. Escalation costs were also included in the estimates of indirect capital costs.

Cost effectiveness analyses do not include escalation. The total annual cost method used in cost effectiveness analysis, as laid out in the Control Cost Manual, expresses costs in real dollars. Thus, they are based on the "real" interest rate, which does not include inflation.[28] Inflation is not included in BACT cost effectiveness analyses as they rely on the most accurate information

[26] Unwin, Stephen D., Johnston, Robert W., and Rudy, Steven W. and Delargey, James E. and Rogers, William. "Selective Catalytic Reduction (SCR) System Design and Operations: Quantitative Risk Analysis of Options," presented at CCPS 17th Annual International Conference: Risk, Reliability, and Security. p. 3, available at http://www.unwin-co.com/files%5CSCR-Risk-Paper,CCPS-RRS2002.pdf (last visited 5/10/2010).
[27] NOx Best Available Control Technology Analysis Study – Supplemental Report, as revised February 2010, p. 4-22, prepared by Burns & McDonnell Engineering Company, Inc. for Minnkota Power.
[28] Control Cost Manual, 3rd Edition, February 1987, pp. 2-13 to 2-14.

available at current prices and do not try to extrapolate those prices into the future.[29] Regardless, no basis is provided for the various escalation factors that were used.

Catalyst Replacement Costs
The cost estimates relied on in the BACT Determination used a catalyst replacement cost of $7,500/cubic meter in 2006 dollars. For new catalyst, this cost is more typically between $3,500 and $6,500/cubic meter. Additionally, catalyst replacement cost did not consider catalyst regeneration, which has become an attractive alternative to purchasing new catalyst since the Cost Control Manual was last updated. Catalyst regeneration typically costs about 60% of the cost of new catalyst.[30]

Foundations and Supports
The direct capital costs associated with foundations and supports range from ~$15.1 – 39.6/kW.[31] This is extremely high compared to upper bound costs reported for other retrofits, which range from $9/kW to $11/kW.[32] These costs should be justified in the record.

Indirect Costs
The indirect costs include owner's costs, which are not included in the Control Cost Manual. The Control Cost Manual does include "home office fees." All owners do not manage and implement capital projects, but rather retain engineering firms, called the owner's engineer, to perform these functions. Other owner activities would be part of its overhead. Cost factors used to estimate capital costs are ordinarily reported all in and would include these costs. Further, these costs, if not directly part of the project, are outside of the battery limits of a control project and would be part of the owner's overhead. Thus, they are not usually separately included in cost effectiveness analyses.

In addition to the cost overestimation issues noted above, we raise concerns about the costs associated with electrical equipment and installation, with the claimed revenue lost from SCR installation and maintenance, contingency expenses, and other issues not apparent due to the lack of available information, especially with regard to the capital costs of the SCR system equipment and the auxiliaries/balance of plant.

<u>Cost Effectiveness Comparisons Are Inappropriate</u>
In addition to artificially high cost estimates, NDDH incorrectly compares the cost effectiveness of installing SCR at MR Young to select regional BART analyses. In so doing, NDDH inappropriately narrows the window of cost comparisons by failing to account for the full range of cost effectiveness determinations in a BACT context, and thereby arrives at the erroneous

[29] See, e.g., Control Cost Manual, 6th Edition, January 2002, Section 1, p. 2-36.
[30] Mike Cooper, New Life for Catalyst, Power Engineering, March 2006.
[31] Based on Minnkota Responses to NDDH Request, NOx BACT Analysis Study, Milton R. Young Station Unit 1 and Unit 2, Regarding SCR Feasibility, December 11, 2009 as revised February 2011, Attachment 1, p. 1.
[32] PowerGen 2005, Selective Catalytic Reduction: From Planning to Operation, p. 25.

conclusion that SCR is not cost effective. In fact, even if the overestimation of costs described above were correct, SCR's cost effectiveness is well within the realm of those established by BACT cost effectiveness thresholds and other BACT determinations.

Cost effectiveness is the economic criterion used to determine whether a given control option has adverse economic impacts compared to controls at similar facilities. Cost, estimated using the total annual cost method, is measured in terms of annualized control costs, and cost effectiveness is measured in annual dollars per ton of pollutant removed.[33] Two cost metrics can be considered: (1) total cost effectiveness and (2) incremental cost effectiveness.

Total cost effectiveness, the metric most commonly used, is calculated by dividing annualized cost by the reduction in emissions, defined as baseline emissions minus controlled emissions.[34] Incremental cost effectiveness compares the costs and emission performance with those of the next most stringent option.[35] Incremental cost effectiveness should not be used to eliminate a top control option as BACT if the total cost effectiveness is acceptable.

BACT is an emission limit based on the maximum degree of reduction that does not cause adverse economic impacts. A technically feasible control option can be eliminated if it results in adverse economic impacts. A technically feasible control option cannot be eliminated simply because its costs are higher than another option. Said another way, BACT is not the control option that minimizes cost, but rather, the control option that maximizes emission reductions without causing adverse economic impacts.

Adverse impacts are defined in terms of "cost effectiveness," which is the annual cost of a control expressed in dollars per ton of pollutant removed. If cost effectiveness is on the same order as the costs deemed to be reasonable for other sources, the control option should initially be considered economically achievable and thus acceptable as BACT. The significance of a given cost effectiveness value is determined relative to the costs borne by sources across the country. Several states have established cost effectiveness thresholds based on pollutant controlled not bound by the emitting source category. Here, applicants rely on a narrow and distortive subset of geographically constricted BART sources where it is required to consider a broader list of factors including relevant non-geographically constrained BACT determinations.

General thresholds for reasonable cost effectiveness have been set in several places. In 2001, U.S. EPA determined that a $10,000/ton control cost ceiling was reasonable for NOx and SO2 in attainment areas, equivalent to over $13,000/ton today.[36] Several air quality districts in

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[33] NSR Manual, Chapter B, Sec. IV.D.2.b.
[34] NSR Manual, p. B.37.
[35] NSR Manual, p. B.41.
[36] See expert report of Matt Haber - EPA, Best Available Control Technologies for the Baldwin Generating Station, Baldwin, Illinois, prepared for the United States in connection with United States v. Illinois Power Company and

California have set cost effectiveness thresholds for NOx, including those set at $9,700/ton,[37] $17,000/ton,[38] and $17,500.[39] The cost effectiveness for the application of SCR at MR Young is below any of these thresholds under any of the scenarios contemplated by the BACT Determination.

BACT determinations have been made for SCR and other technologies well over the costs estimated by NDDH for installation of SCR at MR Young.[40] As part of a BACT determination, the cost effectiveness for SCR at the MR Young facility should be compared to these BACT decisions and thresholds, not to limited select regional BART analyses. Even the high cost estimates in the BACT Determination are well within the range of a reasonable cost effectiveness for a BACT determination.

The BACT Determination also asserts that high incremental cost effectiveness is a reason to dismiss SCR as BACT. As noted above, if the total cost effectiveness is reasonable, as it is here, incremental cost effectiveness should not then be used to discount a top control technology. As described in the NSR Manual,

> "undue focus on incremental cost effectiveness can give an impression that the cost of a control alternative is unreasonably high, when, in fact, the total cost effectiveness, in terms of dollars per total ton removed, is well within the normal range of acceptable BACT costs."[41]

In this instance, SCR is clearly cost effective, even with artificially inflated costs. Furthermore, incremental cost effectiveness would also decrease with more appropriate costing.

<u>Conclusion</u>

The BACT selection process requires selection of the top control technology unless a comprehensive demonstration illustrates that it is inappropriate. For the reasons detailed above, the technical and economic concerns described in the BACT Determination are unfounded and insufficient to constitute a comprehensive demonstration. Thus, as the most effective, feasible

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Dynegy Midwest Generation, Inc., Civil Action 99-883-MJR, in the U.S. District Court for the Southern District of Illinois, April 2002, p. 17; Memorandum of John S. Seitz to Air Division Directors, BACT and LAER for emissions of nitrogen oxides and volatile organic compounds at Tier 2/Gasoline Sulfur Refinery Projects (Jan. 19, 2001), at 3. Costs adjusted using the Chemical Engineering Plant Cost Index (CEPCI).

[37] San Joaquin Valley Unified Air Pollution Control District, Final Staff Report: Update to BACT Cost Effectiveness Thresholds, May 14, 2008.

[38] South Coast Air Quality Management District, Best Available Control Technology Guidelines, Part A: Policy and Procedures, May 21, 1999.

[39] Bay Area Air Quality Management District, BACT/TBACT Workbook: Guidelines for Best Available Control Technology.

[40] See attached examples of cost effectiveness determinations over $5,800/ton from the RBLC database.

[41] B.45 – 46.

control technology, SCR is BACT. We ask NDDH to revise its BACT analysis to require the use of SCR at MR Young accordingly.

Thank you for the opportunity to comment on the Preliminary NOx BACT Determination for MR Young.

Sincerely,

Stephanie Kodish
National Parks Conservation Association
706 Walnut Street, Suite 200
Knoxville, TN 37902
865-329-2424

Mark Trechock, Staff Director
Dakota Resource Council
P.O. Box 1095
Dickinson, ND 58602-1095
701-483-2851

Betsy Daub
Policy Director
Friends of the Boundary Waters Wilderness
401 N. Third Street, Suite 290
Minneapolis, MN 55401

Mary Winston Marrow
Staff Attorney
Minnesota Center for Environmental Advocacy
26 E Exchange Street, Suite 206
St. Paul, MN 55101

Nicole Shalla, Staff Attorney
Plains Justice
100 First Street SW, Suite 201
Cedar Rapids, Iowa 52404

James Gignac

James P. Gignac
Midwest Director
Sierra Club, Beyond Coal Campaign
70 E. Lake St., Suite 1500
Chicago, IL 60601
(312) 251-1680 x147

Cory Counard MacNulty

Cory Counard MacNulty
Executive Director
Voyageurs National Park Association
126 N. Third St, Suite 400
Minneapolis, MN 55401